

T-50-23

The broadest family of CMOS and TTL-compatible oscillators available, NDK 1200 Series Crystal Clock Oscillators offer the convenience of a standard 14-pin DIP socket and are available in a wide range of frequencies from 28kHz to 100 MHz. NDK Crystal Clock Oscillators deliver reliable performance and offer superior resistance to shock, vibration, EMI, and humidity.

#### 1200 SERIES FEATURES

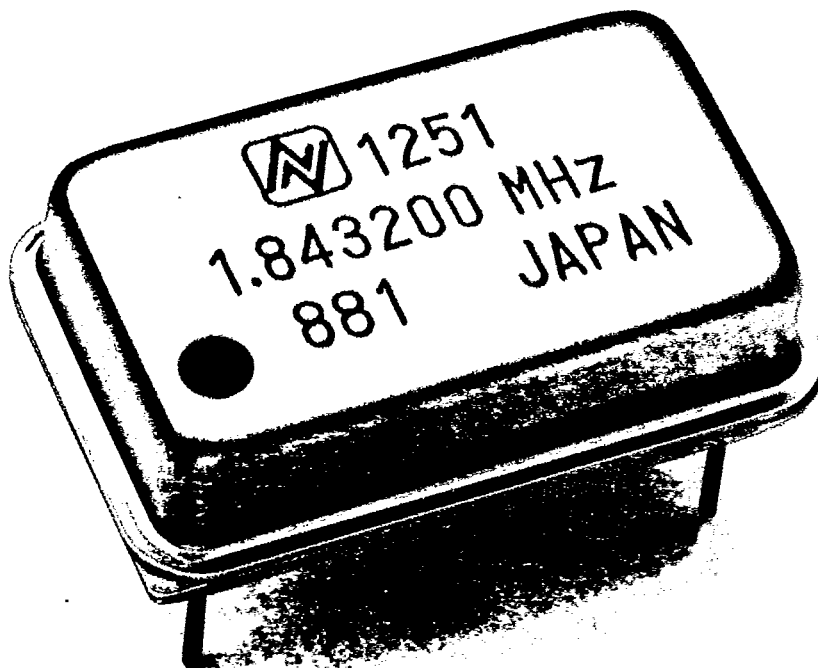
- Broadest range of available frequencies (28kHz to 100 MHz) speeds design and procurement process
- Fits standard 14-pin DIP socket for fast PC-board assembly
- CMOS technology for low power consumption/low heat
- Fast rise and fall times (5,7,10ns)
- Excellent fan out (2 or 5 TTL gates)
- Standby/Dual Output option available
- Sealed, grounded metal case resists EMI and humidity
- Shock and vibration resistant

#### NDK: THE INDUSTRY LEADER

Headquartered in Tokyo, Japan, NDK is the world's premier manufacturer of synthetic quartz crystal. NDK surpasses all other manufacturers in both quality and quantity of synthetic quartz production. NDK offers the widest range of microprocessor quartz crystals, crystal oscillators, and compact crystal oscillators available. All NDK products are fabricated under the strictest quality controls, and are guaranteed to be free from impurities and defects.

NDK standard products are available through a nationwide network of stocking distributors. NDK also offers custom crystal oscillator fabrication to meet individual needs. For more information on NDK custom services or distribution, write:

**NDK America, Inc.**  
20300 Stevens Creek Blvd.  
Suite 400  
Cupertino, CA 95014-2210



**NDK 1200 SERIES SPECIFICATIONS****Available Frequencies****Table 1. 1200 Series Quick-Reference Comparison**

| Frequency Range                | Part Number   | Output       | Power Consumption            | Rise and Fall Times | VOL Maximum<br>VOH Minimum | Duty Cycle %                                  | Fan Out            | Standby/<br>Dual Output |
|--------------------------------|---------------|--------------|------------------------------|---------------------|----------------------------|-----------------------------------------------|--------------------|-------------------------|
| 28 kHz-<br>6.99 MHz            | 1221-<br>1228 | CMOS/<br>TTL | 5mA typical<br>10mA maximum  | 10ns                | 0.5V<br>$V_{DD} - 0.5V$    | 45/55                                         | TTL 2<br>LS-TTL 10 | Standby<br>Only         |
| 7 kHz-<br>22 MHz               | 1229          | CMOS/<br>TTL | 5mA typical<br>10mA maximum  | 10ns                | 0.5V<br>$V_{DD} - 0.5V$    | 40/60                                         | TTL 2<br>LS-TTL 10 | Standby<br>or Dual      |
| 22 MHz-<br>29.9 MHz            | 1230-<br>1232 | CMOS<br>Only | 13mA typical<br>20mA maximum | 5ns                 | 0.5V<br>$V_{DD} - 0.5V$    | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 30 MHz-<br>50.9 MHz            | 1233-<br>1237 | CMOS<br>Only | 17mA typical<br>30mA maximum | 5ns                 | 0.5V<br>$V_{DD} - 0.5V$    | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 51 MHz-<br>70 MHz              | 1238-<br>1239 | CMOS<br>Only | 22mA typical<br>40mA maximum | 5ns                 | 0.5V<br>$V_{DD} - 0.5V$    | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 22 MHz-<br>29.9 MHz            | 1240-<br>1242 | TTL<br>Only  | 13mA typical<br>20mA maximum | 5ns                 | 0.4V<br>2.4V               | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 30 MHz-<br>50.9 MHz            | 1243-<br>1247 | TTL<br>Only  | 17mA typical<br>30mA maximum | 5ns                 | 0.4V<br>2.4V               | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 51 MHz-<br>70 MHz              | 1248-<br>1249 | TTL<br>Only  | 22mA typical<br>40mA maximum | 5ns                 | 0.5V<br>2.4V               | 40/60                                         | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 1.8432 and<br>3 MHz-<br>25 MHz | 1251-<br>1259 | CMOS/<br>TTL | 11mA typical<br>20mA maximum | 7ns                 | 0.5V<br>$V_{DD} - 0.5V$    | 45/55 at $\frac{1}{2}V_{DD}$<br>40/60 at 1.4V | TTL 5<br>LS-TTL 25 | Standby<br>Only         |
| 70 MHz-<br>84.9 MHz            | 1271          | TTL<br>Only  | 25mA typical<br>50mA maximum | 5ns                 | 0.5V<br>2.4V               | 40/60                                         | TTL 5              | Standby<br>Only         |
| 85 MHz-<br>100 MHz             | 1272          | TTL<br>Only  | 35mA typical<br>50mA maximum | 5ns                 | 0.5V<br>2.4V               | 40/60                                         | TTL 5              | Standby<br>Only         |

1271 and 1272 series are BT cut with overall tolerance and stability of  $\pm 200$  ppm.**Table 2. Output Load and Power Consumption** $V_{DD}=5V$ 

| Fan out | TTL                     |                        | LS-TTL                  |                        |
|---------|-------------------------|------------------------|-------------------------|------------------------|
|         | Resistance ( $\Omega$ ) | Power Consumption (mA) | Resistance ( $\Omega$ ) | Power Consumption (mA) |
| 1       | 4,000                   | 1.25                   | 20,000                  | 0.25                   |
| 2       | 2,000                   | 2.50                   | 10,000                  | 0.50                   |
| 5       | 800                     | 6.25                   | 4,000                   | 1.25                   |
| 10      | 400                     | 12.50                  | 2,000                   | 2.50                   |

TTL connected with the output side is equivalent to: 1 TTL=5 LS-TTL.

**SPECIFICATIONS CONTINUED****Table 3. Standby Feature**

A feature designed to facilitate board testing, the standby feature permits external digital signals to control oscillator output.

| #5 pin output<br>#1 pin condition | 1220 Series<br>1250 Series                          | 1230 Series<br>1240 Series<br>1260 Series*<br>1271 and 1272 |
|-----------------------------------|-----------------------------------------------------|-------------------------------------------------------------|
| H level (+4V min.)<br>or OPEN     | Oscillation<br>output                               | Oscillation<br>output                                       |
| L level (+1V max.)                | Oscillation stops with<br>the status at an L level. | Oscillation stops with<br>the status at an H level.         |

\*1260 Series is a standby option of the 1250 Series.

**Dual-Output Option**

Available only on Part Number 1229, the dual-output option permits simultaneous output of the original oscillation frequency and the output frequency multiplied by  $\frac{1}{2}^n$  (where n is a positive integer from 1-8) from separate pins of the device.

When the dual-output option is selected, the optional standby feature is not available.

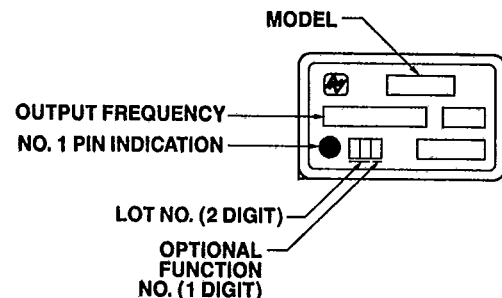
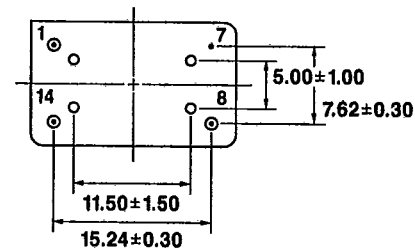
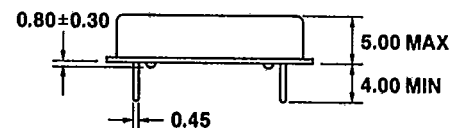
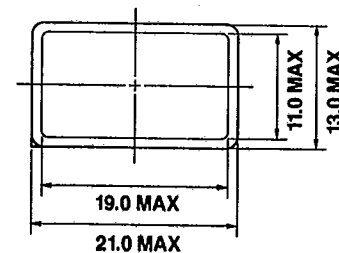
**Table 4. Pinout**

| Pin | Function                                                                  |
|-----|---------------------------------------------------------------------------|
| 1   | NC or standby or output (Part 1229:<br>Divided frequency for dual output) |
| 7   | GND (Ground to case)                                                      |
| 8   | Output (Original oscillation frequency)                                   |
| 14  | +5V DC                                                                    |

**Packaging/Marking**

Only the original oscillation frequency is indicated on Part Number 1229 with the dual-output option.

Dimensions indicated in (mm).



**Absolute Maximum Rating**

- ▶ Source Voltage ( $V_{DD}$ ) -0.5V to +7.0V DC
- ▶ Storage Temperature Range -55°C to +125°C

**Operating Conditions**

- ▶ Source Voltage ( $V_{DD}$ ) +5.0V DC  $\pm 0.5$ V
- ▶ Operating Temperature Range Subject to specifications

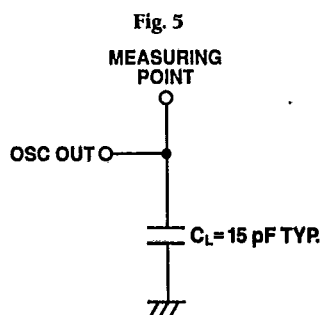
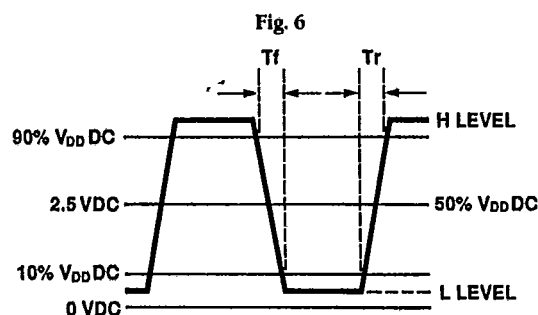
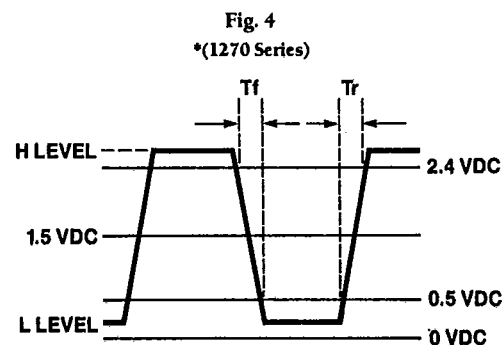
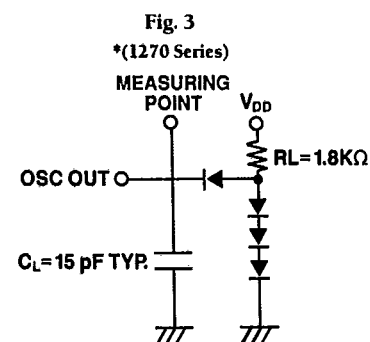
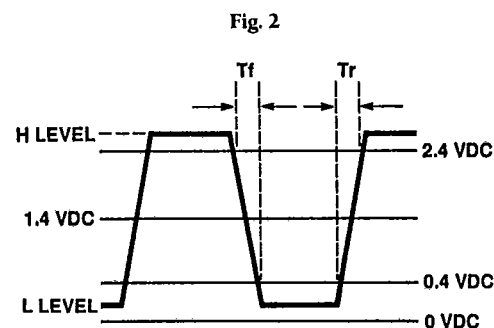
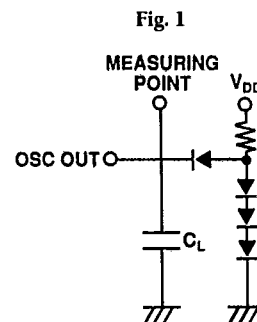
 **$T_r/T_f$  Measuring Conditions**

- ▶ TTL-Compatible Value between VOL max. & VOH min. (Refer to Measuring Load Conditions, Figures 1 & 2)
- ▶ TTL-Compatible\* Value between VOL max. & VOH min. (Refer to Measuring Load Conditions, Figures 3 & 4)
- ▶ CMOS-Compatible Difference between  $0.1 \times V_{DD}$  and  $0.9 \times V_{DD}$  (Refer to Measuring Load Conditions, Figures 5 & 6)

**Table 5. Measuring Load Conditions**

1 TTL=5 LSTTL

| TTL | $C_L$ | $R_L$          |
|-----|-------|----------------|
| 1   | 15pF  | 4 k $\Omega$   |
| 2   | 15pF  | 2 k $\Omega$   |
| 5   | 15pF  | 800 k $\Omega$ |
| 10  | 15pF  | 400 k $\Omega$ |

(Note)  $C_L$ : includes the stray capacitance of measuring system.

**Environmental and Mechanical Characteristics**

- ▶ Vibration No abnormality after vibration under MIL-STD-202F, Method 204D, Condition B. Six hour total test time; three orthogonal directions for two hours each.
- ▶ Shock No abnormality after shock test; MIL-STD-202F, Method 213B, 1000 G, 0.5ms, half sine for one time, each in three orthogonal directions.
- ▶ Humidity No abnormality under MIL-STD-202F, Method 103B, Condition A.
- ▶ Soldering Heat No abnormality under MIL-STD-202F, Method 210A, Condition B.
- ▶ Thermal Shock No abnormality after execution of 100 cycles. Cycle range and duration: -40°C for 30 minutes, +85°C for 30 minutes.
- ▶ Terminal Strength No damage or leakage under MIL-STD-202F, Method 211A, Condition A.

**Handling/Assembly Considerations**

The mechanical and electronic properties of crystal products require that they be handled differently than other components.

- ▶ Bending of Leads Repeated bending or rough handling of leads may break the hermetic seal of the device, leading to performance degradation.
- ▶ Dropping NDK Crystal Clock Oscillators have been designed to resist natural physical shocks. However, drops onto hard surfaces may decalibrate these devices. If a device is dropped, remeasure it to confirm accurate calibration before use.
- ▶ Static These components, like all CMOS devices, should be kept away from static electricity.
- ▶ High Temperature Specifications are not guaranteed if component storage temperature exceeds +125°C for 24 hours.
- ▶ Storage and Solderability The solder-dipped leads of these devices will oxidize over time, negatively impacting solderability. Therefore, we recommend storage of these components be limited to 6 months or less.

**ORDERING INFORMATION**

When ordering, refer to the tables to select the components and options which meet your frequency and specifications.

Please supply the quantity of parts needed, the original oscillating frequency, and the divided frequency (if selecting Part 1229, 7 to 22 MHz, with the dual output option).

**To Specify a Product**

List part number, frequency stability code, option code and desired frequency. An example is shown below:

|               |                       |                 |                     |
|---------------|-----------------------|-----------------|---------------------|
| <b>1251</b>   | <b>B</b>              | <b>1</b>        | <b>1.8432MHz</b>    |
| (Part Number) | (Frequency Stability) | (Output Option) | (Desired Frequency) |

**To Determine Part Number**

Use Table 1 to determine the correct series designation and frequency range. The part listed in the example is a 50 series part. Then refer to Table 9 to determine the correct frequency designation. In the example above, a 50 series 1.8432MHz part is designated by 1251. (12 designates the model, 5 designates the series and 1 designates the frequency range.)

**To Determine Desired Frequency Stability**

Use Table 7. In the example above, the letter B indicates NDK standard is  $\pm 100$  ppm over  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

**To Determine the Desired Output Option**

Use Table 8. In the example above, the number 1 indicates NDK standard which has the standby (enable/disable) feature.

**Table 7. Operating Temperature/Frequency Stability Code Chart**

| Operating Temperature                          | Frequency Stability |                     |                     |
|------------------------------------------------|---------------------|---------------------|---------------------|
|                                                | $\pm 50\text{ppm}$  | $\pm 100\text{ppm}$ | $\pm 200\text{ppm}$ |
| $0^{\circ}\text{C} \sim +70^{\circ}\text{C}$   | A                   | B                   | —                   |
| $-10^{\circ}\text{C} \sim +70^{\circ}\text{C}$ | —                   | G                   | —                   |
| $-20^{\circ}\text{C} \sim +70^{\circ}\text{C}$ | —                   | M                   | 1271<br>1272        |

**Table 8. Standby/Dual Output Option Code Chart**

| Option                 | Applicable Code | Parts |
|------------------------|-----------------|-------|
| Not Connected on Pin 1 | 0               | All   |
| Standby Active         | 1               | All   |
| Dual-Output Active     | 2               | 1229  |

**NDK 1200 SERIES**

**Table 9.**

| Part Number | Output   | Frequency (MHz)          |
|-------------|----------|--------------------------|
| 1221        | CMOS/TTL | 0.028 $\approx$ 0.053    |
| 1222        |          | 0.054 $\approx$ 0.108    |
| 1223        |          | 0.109 $\approx$ 0.217    |
| 1224        |          | 0.218 $\approx$ 0.436    |
| 1225        |          | 0.437 $\approx$ 0.874    |
| 1226        |          | 0.875 $\approx$ 1.740    |
| 1227        |          | 1.750 $\approx$ 3.490    |
| 1228        |          | 3.500 $\approx$ 6.990    |
| 1229        |          | 7.000 $\approx$ 22.000   |
| 1230        | CMOS/TTL | 22.000 $\approx$ 22.900  |
| 1231        |          | 23.000 $\approx$ 25.900  |
| 1232        |          | 26.000 $\approx$ 29.900  |
| 1233        |          | 30.000 $\approx$ 33.900  |
| 1234        |          | 34.000 $\approx$ 35.900  |
| 1235        |          | 36.000 $\approx$ 39.900  |
| 1236        |          | 40.000 $\approx$ 43.900  |
| 1237        |          | 44.000 $\approx$ 50.900  |
| 1238        | TTL only | 51.000 $\approx$ 59.900  |
| 1239        |          | 60.000 $\approx$ 70.000  |
| 1240        |          | 22.000 $\approx$ 22.900  |
| 1241        |          | 23.000 $\approx$ 25.900  |
| 1242        |          | 26.000 $\approx$ 29.900  |
| 1243        |          | 30.000 $\approx$ 33.900  |
| 1244        |          | 34.000 $\approx$ 35.900  |
| 1245        |          | 36.000 $\approx$ 39.900  |
| 1246        | CMOS/TTL | 40.000 $\approx$ 43.900  |
| 1247        |          | 44.000 $\approx$ 50.900  |
| 1248        |          | 51.000 $\approx$ 59.900  |
| 1249        |          | 60.000 $\approx$ 70.000  |
| 1251        |          | 1.8432                   |
| 1251        |          | 3.000 $\approx$ 10.900   |
| 1252        |          | 11.000 $\approx$ 11.400  |
| 1253        |          | 11.500 $\approx$ 12.900  |
| 1254        | TTL only | 13.000 $\approx$ 14.900  |
| 1255        |          | 15.000 $\approx$ 16.900  |
| 1256        |          | 17.000 $\approx$ 17.900  |
| 1257        |          | 18.000 $\approx$ 19.900  |
| 1258        |          | 20.000 $\approx$ 21.900  |
| 1259        |          | 22.000 $\approx$ 25.000  |
| 1271        |          | 70.000 $\approx$ 84.900  |
| 1272        |          | 85.000 $\approx$ 100.000 |